Responses to the 2021 Recommendations
of the Atlantic Regional Scientific Review Group

1. The Atlantic SRG commends NOAA for the inclusion of a total mortality estimate (i.e., effectively the sum of observed and "cryptic" mortality) within the North Atlantic right whale (NARW) stock assessment report (SAR). The Atlantic SRG recommends that NOAA reassess the 1:1 apportionment of mortality between the US and Canada based on recently observed M/SI. Also, the Atlantic SRG recognizes that there is likely more M/SI resulting from entanglements than vessel strikes, and recommends that NOAA review analyses by Pace et al. (2021), Linden (2021), Sharp et al. (2019), and Moore et al. (2020) to assign an interim apportionment by cause of mortality in the 2020 SAR.

The current draft NARW SAR for 2019 (Table 1) estimates an Nbest of 368, Nmin of 364, Rmax of 0.04, Fr of 0.1, and hence a PBR of 0.7. Table 2 provides an estimate of observed average total mortality and serious injury of 7.7 for 2015-2019 and, once cryptic mortality is included, an estimated total mortality of 27.4. For that same period, the average calf count was 6.7 (Pettis et al. 2020). Thus, in this recent period, the population declined by 20 individuals per year, with an estimated mean annual population growth rate of -0.054 (-19.7/368). PBR was exceeded by a factor of almost 40 times (27.4/0.7).

Thus, we conclude that focusing PBR only on serious injuries and mortalities fails to consider the impacts that sublethal injuries (and the resulting reduction in reproduction) has on species recovery. Just as lethal takes have increased substantially in both the US and Canada, so have the number of whales with evidence of sublethal trauma. As stated in this report: "The available evidence suggests that at least some of the observed variability in the calving rates of North Atlantic right whales is related to variability in nutrition (Fortune et al., 2012) and possibly increased energy expenditures related to non-lethal entanglements (Rolland et al., 2016; Pettis et al., 2017; van der Hoop et al., 2017)." Therefore, at this time, especially for the few remaining mature females, it is critical to better understand and account for the relationship between nutrition and entanglement, and other stressors such as sub-lethal vessel strike and noise in the energetic budget of this species. We must not only reduce mortality, but also enhance reproduction by minimizing, if not removing, those anthropogenic stressors that we can manage. We can do little about the prey base of the species, but it is critical that future SARs begin to enumerate and report trends in sublethal trauma and individual health to better guide management efforts to truly effect recovery of this species as required by the MMPA and ESA. To these ends, we urge the agency to develop and use the tools and approaches reviewed in Fauquier et al. (2020) and Moore et al. (2021).

Furthermore, we point to the current SERDP [Strategic Environmental Research and Development Program] project "Towards an Understanding of the Cumulative Effects of

Multiple Stressors on Marine Mammals," which has a NARW Case Study, focused on modelling the population consequences of such multiple stressors, with Cape Cod Bay as the field site. Ensuring acquisition of data to parameterize these models is critical to understand the demographic effects of sub-lethal trauma.

Response: As the Atlantic SRG recognized, the situation with NARWs remains grave. With the NMFS publication on cryptic mortality, we recognize (and can now quantify) mortality to be significantly larger than observed. We are working on methodologies to apportion mortality by cause and region/nation, but we would caution that the 1:1 apportionment was previously reviewed by a Center for Independent Experts (CIE) panel in November 2019 and evaluated as most appropriate given limited data. There has been little pattern change in observed Mortality and Serious Injury (M/SI) since that meeting, and Pace et al. 2021 cautions against apportionment based on assumed correlation between seen and unseen events due to many conflicting detection biases.

In regard to the challenges of multiple stressors and sublethal impacts, we agree that such phenomena are likely limiting reproduction in this population. To that end, we have continued to invest in the analysis of this by providing regular funding to the New England Aquarium. We will consider the approaches of Fauquier et al (2020) and Moore et al (2021). In addition, we call the Atlantic SRG's attention to the New England Aquarium annual contract report (Hamilton 2020) tasks 2-5, pages 43-113 and ask the SRG identify any summary information in particular they would like to see in future NARW SARs. Similarly, we would call the SERDP's attention to this report, since any data that might potentially be available are likely already synthesized there.

Finally, it is important to note in making management decisions under both the ESA and MMPA, NMFS relies on the best scientific information available, and in some cases, this may mean considering additional information not explicitly contained in SARs, such as that found in Hamilton 2020.

2. The Atlantic SRG is concerned by the apparent lack of funding for long-term marine mammal monitoring in the Gulf of Mexico to support stock assessments required by the MMPA, and recommends that NOAA prioritize survey data collection and analysis in the Southeast Fisheries Science Center (SEFSC's) budget. NOAA should not rely on external research funding to conduct routine monitoring.

Response: NMFS Science Centers that conduct multispecies cetacean and ecosystem broad-scale surveys to support marine mammal stock assessment reports rely on external funding from federal partners, such as the Bureau of Ocean Energy and Management (BOEM) and the U.S. Navy. NMFS Science Centers provide staff time, analytical expertise, and ship-time, which are

significant matching costs. Due to static protected resources budgets since 2010, there are currently insufficient internal funds for NMFS to support Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS) or any other broad-scale marine mammal survey. For the last 10 years or more, NMFS has leveraged partnerships with federal partners to accomplish our mandates under the MMPA and ESA – this will likely continue unless there are significant increases in appropriations for protected resources.

3. The Atlantic SRG would like to commend NMFS for continuing to develop and improve the functionality of the NARW Decision Support Tool (DST). The DST fills an important need by attempting to quantify the risk-reduction benefit assigned to different management strategies. This also allows for more targeted actions that can maximize the benefit to right and other large whales, while minimizing the impact on the fishing industry. As the DST continues to be updated, refined, and expanded to other species, the Atlantic SRG recommends:

a. Pursue methodologies to validate the model by conducting hindcasts where possible, or by identifying a subset of entanglements for which hindcasts could be performed. The Atlantic SRG realizes that most right whale entanglements cannot be traced to a source or point of entanglement. As the DST moves to incorporate other species of large whales, it could be possible to analyze other known entanglement cases for which the point of entanglement is known, such as anchored animals. Some species, such as minke whales, are anchored relatively frequently when entangled and could provide a larger dataset of cases in which details are known about the location and nature of entangling gear.

Response: As the Atlantic SRG recognizes, there are unfortunately little data against which to validate this model. However, we agree that this would be a valuable exercise with the data that are available. We appreciate the recommendation and will pursue testing the performance of this tool with minke whales. There are also somewhat more data for humpback whales than right whales that could also be assessed as we have existing distribution and threat models for humpbacks.

b. Continue to build, expand, and share the DST so that it can be utilized for other species and gear types. This should include integrating other types of fixed gear and expanding areas of concern. This extension to other species could include small cetaceans, sea turtles, and seals.

Response: The model is currently undergoing significant expansion to include ~20 smaller gillnet and trap / pot fisheries along the east coast. With these in place, it will be easy to apply this model to a broader list of species, at least for examining co-occurrence of species and fishing gear. Developing threat models for the longer species list will take more time and effort until a generalized tool can be developed to examine how different animals interact with fixed fishing gear.

c. Upgrade the utility of the DST by improving the fishery information that informs it. One of the major issues with the current version of the DST is the lack of fine-scale spatial fishing effort information, especially in federal waters. The Atlantic SRG believes it is imperative to begin collecting this information with significantly better coverage and precision and, therefore, recommends that NMFS requires vessel monitoring systems on all federally permitted fixed-gear fishing vessels. Without this information, NMFS will be unable to deliver on the requests to target new regulations to areas of highest risk and the DST will not be able to provide the fine-scale risk and impact analyses for which stakeholders are asking.

Response: We agree that the model could be improved with the collection of higher-quality, finer-resolution spatial data on fishing effort. These data are also important for other aspects of marine spatial planning associated with this fishery. Vessel tracking for the lobster fishery is under active discussion at NMFS and Atlantic States Marine Fisheries Commission (ASMFC) with an ongoing pilot project, led by the states, for assessing cost-effective methods for collecting vessel tracking data. We also note that this should be accompanied by improved data collection on fishery gear and endline configurations to establish a timeline of how this gear is changing and the impacts of management actions. NMFS may also raise requiring (Vessel Monitoring System on all fixed gear fisheries with the Atlantic Large Whale TRT to further this suggestion.

d. Work to pair the DST with other models being developed, such as the Pace, Linden, and Population Evaluation Tool models, to develop a tool for a Management Strategy Evaluation (MSE).

Response: The ASMFC recently began discussions on conducting a MSE for the lobster fishery. In these discussions, managers have similarly identified a desire to understand how management actions or environmentally-driven shifts in the distribution of lobsters and the associated fishery may affect interactions with whales, or how entanglement mitigation measures may impact the lobster fishery. ASMFC's lobster Technical Committee has proposed an incremental approach to MSE, starting with simpler models that are more fishery-centric and progressing to more complex, spatial models that can explicitly address climate change impacts and interactions with changing whale distributions.

4. The Atlantic SRG commends NOAA for preparation of its "North Atlantic Right Whale (*Eubalaena glacialis)* Vessel Speed Rule Assessment." We continue to support the use of speed restrictions to reduce lethal vessel strikes, which are responsible for at least one-quarter of observed Serious Injuries and Mortalities for North Atlantic right whales. We are particularly troubled by the lack of compliance with speed restrictions in the Southeast and Mid-Atlantic, and with the lack of restrictions on vessels under 65 feet in length. In this regard, we suggest that NOAA consider new rulemaking to address these issues, and consider supporting this rulemaking by modeling the risk reduction of alternatives using a modified version of NOAA's Decision Support Tool. A variety of alternatives or scenarios should be considered as part of this including:

a. Spatial/temporal non-voluntary speed restrictions ranging from:

i. A single speed restriction for the entire U.S. Northwest Atlantic Ocean shelf, at a speed that could be modeled to achieve the necessary risk reduction;

ii. Expanded Seasonal Management Areas (SMAs) reflecting a combination of the original SMAs coupled with additional SMAs for areas of recently observed high right whale abundance south of Block Island to Nantucket Island as well as areas in the Mid-Atlantic which have had frequent Dynamic Management Areas; and

iii. Status quo (the existing SMAs and the historical pattern of DMAs) for comparison, recognizing that this option is clearly inadequate.

b. Maximum 10-knot speed requirement on all vessels under these spatial/temporal restrictions versus status quo of maximum 10-knot speed limit only for vessels greater than 65 feet (we note that a speed restriction on smaller vessels also improves safety for vessel operators).

c. A scenario considering how continued climate instability might affect the pattern of DMAs.

d. Effects of increased vessel traffic in support of windfarm construction and maintenance.

With respect to the recommendations of the report, the Atlantic SRG strongly supports:

e. An expansion of the current SMAs (in particular to include the areas from south of Block Island to Nantucket Island).

f. A continuation of the use of the DMA tool but with the change that these be required (rather than voluntary) 10-knot speed restrictions. We further suggest that NOAA investigate "frameworking" this regulation (as is the case with many Magnuson Act regulations) to facilitate the speed of implementation of any DMA closure.

g. Require all vessels within an SMA or DMA to conform to the 10-knot speed restriction.

Finally, we support both research recommendations within the report. We also suggest that NOAA develop a tool similar to the North Atlantic right whale Decision Support Tool that can be used to support vessel strike risk reduction analyses throughout the US EEZ.

Response: We appreciate these suggestions and will consider them along with the public comments we received on the report. We are currently exploring options for evaluating risk of vessel strike coast wide. Additionally, we are pursuing analyses that overlap with some of the

scenarios suggested and intend to consider factors such as likely future vessel traffic from planned offshore development.

Our understanding of the mechanics, risk factors, and extent of vessel interactions continues to grow, but we still lack a fundamental understanding of how whales perceive and react to vessel traffic and how an animal's demographic profile and behavior state may influence this. The primary tools available to mitigate vessel strikes remain limited to slowing vessel traffic, and separating whales and vessels via transit routing measures. These tools do have their limitations. Practically, NMFS cannot route large ships through areas that might be dangerous (too shallow, etc.) or close port/harbor entrances to vessel traffic or mandate transit speeds so low that vessel functionality or maneuverability is compromised.

5. The Atlantic SRG notes continuing discrepancies in the number of decimal places used for the coefficient of variation (CV) of Nbest when calculating Nmin and PBR. This can result in substantial differences in these calculations, particularly for larger stocks, as has been discussed at several previous Atlantic SRG meetings. The Atlantic SRG recommends NOAA decide on an appropriate number of decimal places to use when reporting and using estimates of the CV of Nbest and be consistent in their calculations of Nmin and PBR across all stocks.

Response: We will be more careful to always calculate the Nmin on full precision values of the Nbest CV and to calculate PBR on full precision values of Nmin in accordance with our Guidelines for Assessing Marine Mammal Stocks (GAMMS).

6. Northeast Fisheries Science Center (NEFSC) SARs:

a. The Atlantic SRG noted the recent increase in gray seal serious injury and mortality in the Northeast Sink Gillnet fishery, which exceeded 2,000 individuals for the first time in 2019, exceeding the current PBR of 1,364. At the same time, we note that the U.S. portion of this trans-boundary stock continues to increase rapidly, at least as reflected by pup counts at most colonies. The best available scientific information indicates that this robust stock of gray seals continues to recover, driven, at least in part, by emigration from large Canadian colonies, such as that on Sable Island. Thus, the Atlantic SRG recommends:

> i. The NEFSC work towards refining the abundance of gray seals in the SAR by calculating the proportion of time the entire population of seals spends in U.S. waters. This could be established by a coordinated program of satellite telemetry in the U.S. and Canada, together with analysis of existing telemetry data. Particular care should be given to understanding the movements of juvenile seals, which dominate the bycatch in the Northeast Sink Gillnet Fishery. In the meantime, the Atlantic SRG believes that it is appropriate to calculate an interim value of Nmin by pro-rating the total estimate of abundance by the proportion of pups born on U.S. versus Canadian haul-outs.

Response: We appreciate the need to refine the abundance of gray seals in the SAR by calculating the proportion of time the entire population of seals spends in U.S. waters. We are working toward this goal by trying to expand our gray seal satellite telemetry program and coordinating with Canada to pool existing telemetry data. In the interim, current estimates of Nmin for the U.S. portion of the stock are calculated based on the proportion of pups born in U.S. colonies. This is essentially the same value if abundance estimates in both countries were added together and then the total estimate was prorated by the proportion of pups born on U.S. versus Canadian haul-outs.

ii. The SAR employ a value of Rmax of 0.128, the maximum rate of increased observed on the well-studied gray seal haul-out at Sable Island, Nova Scotia (Bowen et al., 2003).

Response: We will plan to use an Rmax of 0.128 for calculating the gray seal PBR in the 2021 SAR. Punt *et al.* 2020 suggested an Rmax of 0.141 be used and we feel that further discussion on the most appropriate Rmax to use is warranted since there are other analyses due to be published.

b. The Atlantic SRG is also concerned that the current estimate of serious injury and mortality for gray seals in the Northeast Sink Gillnet fishery is negatively biased because it does not account for mortality of entangled seals that break free from the netting. Many sub-adult and adult seals are large enough to escape from the gear but carry net fragments with them, typically around their necks. A preliminary drone survey showed a range of 1–4% of hauled out seals had such necklaces (Martins et al., 2019). These seals are likely to suffer mortality without intervention and should be counted as seriously injured. In so doing, PBR would likely be further substantially exceeded. The Atlantic SRG recommends standardized surveys be conducted by the NEFSC and its research partners to further estimate the number of seals injured in this manner on U.S. haul-out sites. It is also important to note that the magnitude of serious injury and mortality in Canadian waters is unknown and the value provided in the SAR is likely negatively biased.

Response: We agree that the estimate of serious injury and mortality for gray seals in the Northeast sink gillnet fishery is negatively biased. We are working with our research partners and stranding networks to develop a system to better document live entangled animals and establish a protocol for identifying unique individuals so that they are not double counted each year. The NEFSC seal program does not currently have resources available to conduct standardized surveys to estimate the number of entangled seals on all U.S. haul-out sites.

c. The Atlantic SRG commends NOAA on the new harbor seal population model that normalizes data taken under different conditions over the years in order to produce a more comprehensive picture of the population trajectory in U.S. waters. Due to the large uncertainty in each census, a definite decline in the overall population could not be determined. The decline in the number of pups born between the early 2000s and 2018 appears more convincing, although still not

statistically significant. Listing possible factors responsible for a decline is not consistent with the finding of no significant difference, and gives the impression that one has been determined. Additional censuses taken under more controlled conditions added to the model might help determine if a decline is real.

Response: We will modify the text in the 2021 harbor seal SAR to emphasize the decline was not statistically significant.

d. Given the harp seal is a transboundary species, with no resident U.S. population, our recommendation is that a PBR be calculated primarily based upon the Canadian censuses. This treatment would be consistent with other transboundary stocks of seals and cetaceans.

Response: We will calculate a harp seal PBR based on the Canadian census. However, because we have information on U.S. fisheries mortality and very limited information on Canadian fisheries mortality, our assessment of total removals with respect to PBR will be skewed toward the U.S.

7. The Atlantic SRG supports the continued development of analytic tools for standardizing bycatch assessments, with the Random Forest Modeling approach being a good example. We are concerned, however, about how this tool would actually be implemented. To this end, we suggest the SRGs could host a discussion with the tool's developers and with Center/Regional Office staff responsible for analyzing serious injuries to begin development of protocols for incorporation of the tool in the SI/M determination process. Such a discussion should include, but not be limited to:

a. How the tool can be used to inform cryptic mortality/sublethal trauma.
b. Standardized assignment of typical phrases and words used in the model so as to minimize gaming outcomes.
c. Performance evaluation of alternative assignment of phrases/words used in model.
d. Consider alternate importance measure selection algorithms such as Boruta (Kursa and Rudnicki, 2010; Kursa and Rudnicki, 2018) or Altmann et al. (2010) which have been shown to perform well in a variety of settings with numerous highly correlated predictors (Degenhardt et al., 2019).
e. Development of standardized data-collection protocols that would be repeatable across regions.
f. Training of field staff for consistent collection of the data required by the tool. If NOAA is interested in this approach, the Atlantic SRG would volunteer to start the discussion.

Response: NMFS appreciates the review and interest in the random forest (RF) approach to assess large whale serious injury (SI). Concerns about implementation of the RF tool were also mentioned by the Pacific Scientific Review Group. These concerns center on what may be

described as ‘unsupervised assignments’ or by analogy, ‘driverless car’ safety issues. NMFS would like the SRGs to know that the serious injury policy revision working group (which includes membership of all NMFS Science Center personnel involved in large whale SI assessments) has agreed that if the RF approach is implemented, SI assignments derived from RF models will be presented side-by-side with currently used SI protocols for direct comparison and transparency. This will allow for a quantitative assessment of how many serious injuries are derived using each method. We address the finer Atlantic SRG points below.

a. Our random forest (RF) method requires ‘known outcomes’ to create models. Models are then used to predict health status and/or probability of death for whales with ‘unknown outcomes.’ Some sublethal effects such as reduced survival are by default, 'baked into' the probability estimates of death for unknown outcome cases (e.g., a whale with a deep laceration will be assigned a higher probability of death than a whale with a superficial laceration). Sublethal effects that involve reduced fecundity resulting from chronic entanglement are harder to quantify, except through long-term observation of individual females with known entanglement and reproductive histories. It may be possible to bring these types of variables into the RF model if enough known outcome cases with reduced fecundity are available for models and we will make an effort to do so. Estimation of cryptic mortality using the RF serious injury application may not be possible, assuming the definition of cryptic mortality in this case represents entanglements or vessel strikes that are never observed in the first place. The RF tool is limited to estimating probability of death for observed cases and does not have the functionality to estimate the number of undetected cases. However, the RF tool does provide an estimate of the probability of death for detected cases that are only seen once or for which final outcomes are unknown.
b. Standardizing phrases used in large whale narratives is an evolving goal. We are encouraged by our high RF cross-validated classification accuracy initially obtained prior to any national-level standardization. Narratives come from many sources, including members of the public who may not apply such phrases as ‘constricting entanglement’ or ‘multiple wraps.’ It is up to the serious injury assessment scientists to translate such narratives to a standard language, which is implemented under the current SI protocols. For example, if a sailboat operator reports a whale entangled in rope that is ‘cutting deeply into the whale,’ this is taken to be equivalent to a ‘constricting entanglement’ under current SI protocols, as well as the RF application. Concerns over the ability to ‘game the outcomes’ through narrative manipulation are likely overstated, as it has been possible to do the same since the SI policy was implemented in 2013. Published descriptions of the NMFS SI protocols are available for anyone to read and in practice are much easier to ‘abuse’ than a RF algorithm that would house narrative variables in R-programming language scripts used to create and apply RF models. To date, we have not been aware of any evidence of ‘gaming’ the SI outcomes from either reporting parties or scientists who implement the process.

c. We agree that evaluating additional narrative phrases used in RF models is useful. Variables currently used in RF models are derived from the existing SI policy / procedure, in addition to others brainstormed during model development. The high RF classification accuracy of health status (~85 - 96% depending on species and injury type) for cross-validated known outcome cases suggests that the original NMFS SI policy implemented in 2013 has largely identified those criteria that are excellent predictors of health status. However, we agree that RF models should not be static as new important variables may be discovered or the modes by which whales are injured by anthropogenic sources may change. The costs and benefits of such model optimization must be weighed against the potential gains in predictive accuracy, however, addition of new variables is an easy implementation in the RF model.
d. The RF method handles correlated predictors quite well and we have made an effort to pool correlated narrative phrases into single 'umbrella' variables to address such concerns. The suggested work of Degenhardt et al. (2019) notes that users of RF models may be interested in two goals. They eloquently summarize the goals as "If building a prediction model is the main goal of a study, often a minimal set of variables with good prediction performance is selected. However, if the objective is the identification of involved variables to find active networks and pathways, approaches that aim to select all relevant variables should be preferred." The emphasis on complex variable selection procedures cited in this and other papers recommended by the Atlantic SRG pays tribute to highly-dimensional datasets that often involve biochemical or genomics (= 'omics') data. With 'omics' data, identification of as many important predictors as possible is emphasized because the absence of a given predictor involved in a complex biochemical or genetic pathway can severely limit the predictive accuracy of RF models or limit interpretation of such pathways, which are critical to know in medical applications. In the case of large whale SI models, NMFS believes that most of the important predictors have already been identified by the original SI working group in 2008, which is reflected in RF models with cross-validated classification accuracies much higher than expected by chance. NMFS believes that in the context of RF models for SI assessment, variable inclusion ("throw the kitchen sink at the model") is more important than variable selection, because the RF algorithm will ignore unimportant variables anyway. The manner in which our variables are coded (binary presence / absence) eliminates the issue of variable selection biases described by Strobl et al. (2007), where variables with different scales create importance biases related to their level of discreteness (variables with a greater number of values may be used to split data at tree nodes more often than their importance would warrant). It should be noted that one of the variable selection methods promoted by Degenhardt et al. (2019) is permutation of the response variable to assess predictor importance by creating a null distribution of importance scores (mean decrease in predictive accuracy) and comparing actual variable importance scores to this

null distribution. This is the method currently employed in our RF models and reported at the SRG meetings and in the manuscript for review.

e. We agree that standardized data collection protocols are necessary for the successful implementation of the RF method. Currently, all large whale serious injury cases undergo cross-Center science review by injury assessment scientists. This is an annual requirement that will be retained and has led to convergence in how SI protocols are applied nationally. Use of the RF method to assess SI would focus more on phrase and variable standardization in narratives and expansion of variable identification to ensure that differences in regional language usage pertaining to the same injury types are 1) captured in 'umbrella variables' and 2) promote convergence of language use. The latter is seen as more challenging, given different regional fisheries and species.
f. We agree that consistent data collection and formatting for use with the RF tool is necessary. Currently, models only require a narrative and a health status field. Variables are generated as additional presence / absence fields directly from narratives and appended to existing data. It is anticipated that an online version of the tool would involve simply uploading a text file (i.e., CSV) with a row for each whale record for model updates and prediction to unknown outcome cases. Formatting currently overlaps with existing SI databases maintained by Science Centers.

8. The Atlantic SRG heard with interest the presentation on the AMAPPS by Dr. Palka. During post-presentation discussions, it was recommended that NMFS consider fully implementing aerial data collection using the digital geometer system. The Department of Fisheries and Oceans (DFO) in Canada has been using these during aerial survey efforts since 2016 and finds them to significantly improve the speed and quality of data collection. As a means to facilitate this, Dr. Lawson will send Dr. Palka copies of DFO's custom visual survey software and user manual that has recently been developed to make full use of the geometers (and as a replacement to the aging VOR software).

Response: We received the DFO custom software from Dr. Lawson, and NMFS will have it set up for the summer survey when we will try out the new system. We thank Dr. Lawson for sharing.

9. The Atlantic SRG would like to commend the NOAA cetacean stock assessment team for their efforts in exploring and developing novel approaches for the analysis of temporal changes in cetacean stock abundance. The Atlantic SRG noted that temporally stationary relationships were assumed in the analysis, which may not be realistic given the changes in the ecosystems. This stationarity assumption can be evaluated by allowing for time-varying parameters in the models, but this approach may not work given the limited data points available. Sensitivity analysis may be an alternative approach to evaluate the temporally stationary assumption. The Atlantic SRG suggests that cross validation be conducted to evaluate predictive power of this type of model. For example, the 2021 observation can be compared with the model-predicted 2021 estimates to examine if the observed value falls within the predicted confidence intervals. The Atlantic SRG further recommends that the data collected in Canada by the DFO St. Andrews Biological Station be included in the analysis to improve the sample size and spatial coverage.

Response: NMFS appreciates these useful comments and intends to incorporate them. Hopefully we will have another draft of this project ready for review at the next Atlantic SRG meeting.

10. SEFSC SARs:

a. Given the limited number of survey observations available and considerable uncertainty in estimates of abundance generated from survey data for most marine mammal species in the Gulf of Mexico, the Atlantic SRG suggests revising trend analysis wording in the Gulf of Mexico SARs in sections on "Recent Surveys and Abundance Estimates" and "Current Population Trends," as outlined in our letter dated Feb 5, 2021, removing abundance estimates from the "Trends" section.

Response: We will revise the wording of the "Current Population Trends" section in the subsequent SAR cycle. Per our understanding of the discussion and recommendations provided during the Atlantic SRG meeting, we will include prior year and recent abundance estimates in the Trends section text, and will note, where appropriate, that two point estimates are insufficient to analyze trends and make a substantial conclusion.

b. The Atlantic SRG commends the SEFSC for its continued efforts to include quantified effects of the Deepwater Horizon oil spill (DWH) in the Gulf of Mexico SARs and notes challenges associated with this. However, in the one case where empirical data from surveys have been available to test the model, the Gulf of Mexico western coastal stock of common bottlenose dolphin, results suggest that the model is incorrect as there are no significant differences between abundance estimates from 2011–2012 and 2017–2018. In this case, the value of DWH model-based mortality is questionable and should be removed from the SAR. In other cases, where even informal evaluation with empirical data is not possible, consistent with our recommendations from last year, we recommend moving the model-based mortality discussion to the Habitat section of the SARs for each species. Model-derived information on percent decline in abundance, annual mortalities (annual average and trends), and lost cetacean years should be

presented there, along with an explanation of why the data are not incorporated into the stock assessment calculations.

Response: Similar to our response from last year, NMFS believes that the population modeling for DWH impacts is consistent with providing the best scientific information available. Since mortality estimates derived from the model have already been incorporated into published stock assessment reports, and the DWH injury assessment and restoration plans, we do not support removing these estimates from the SAR. Given the scope of the DWH event, the expected long recovery time for some stocks, and the associated restoration efforts, it seems appropriate that the impact of the oil spill to these stocks be properly recognized in the SARs. Specifically, for the Western Coastal Stock of common bottlenose dolphins, the DWH model predicted a very small change in population size (5% maximum reduction) and a relatively short time to recovery. The two available population estimates are not significantly different from one another, which is consistent with the expectations from the model.

c. Shrimp Trawl Fishery Observer Coverage

The Atlantic SRG recognizes the uncertainties involved with estimating bycatch from small sample sizes but notes that the absolute number of samples is a more important consideration than the percent coverage, assuming observer coverage is deployed in a representative fashion. This is an issue that the NEFSC has dealt with for a number of years for both protected species and fish (as part of the "Standardized Bycatch Reporting Methodology") bycatch, and we recommend that SEFSC analysts consult with their peers at the NEFSC on the issue. They can also discuss how the NEFSC has determined the requisite number of samples to provide adequately precise bycatch estimates, and from this evaluate the appropriate level of observer coverage in the various elements of the shrimp trawl fishery.

Response: We commit to a discussion between NEFSC and SECFC analysts on bycatch estimation. As noted in the presentation at the Atlantic SRG meeting, the representativeness of the observer coverage is a challenge for bycatch assessment in the shrimp fishery. In particular, there is a lack of observer coverage for estuarine waters and for skimmer trawls, and this limits our confidence in the resulting estimates of bycatch. The analysis demonstrates that the current level of observer coverage (presented as either an absolute number of trips observed or a percentage coverage) results in approximately one observed take per year, and nearly all strata have zero observed bycatch in any given year. Combining data across 20 years of observations still results in estimates (CV > 0.3) for most strata. Therefore, additional observer coverage would be needed to obtain more precise and accurate estimates. Further, dedicated observer program effort is needed on inshore state-permitted skimmer and otter trawl vessels. If the opportunity arises to expand or re-allocate observer coverage, then SEFSC would employ methods similar to those used by NEFSC or other researchers to determine the most appropriate number of trips to observe per analysis strata.

d. The Atlantic SRG recognizes the need to increase observer coverage for the Atlantic and Gulf menhaden purse seine fisheries in the Gulf of Mexico and Atlantic Ocean, and encourages the adoption of newly developed technological approaches to observe this fishery if increasing the numbers of human observers is not possible.

Response: NMFS appreciates the Atlantic SRG's acknowledgement of the need to increase observer coverage in this fishery. We agree, especially in the Gulf of Mexico fishery where bottlenose dolphin takes have been documented and self-reported by industry. We also agree that new approaches need to be considered and tested given the challenges with how the purse seine fishery operates, and challenges with the use of traditional observation techniques with human observers. Implementation of the DWH Open Ocean Trustee Implementation Group (TIG) project to develop methods to observe sea turtle interactions in the Gulf fishery should provide insight on potential observation approaches that may be appropriate to detect marine mammal takes.

e. NMFS staff reported that they are moving in the direction of creating individual SARs for each of the 31 bay, sound and estuary (BSE) stocks of common bottlenose dolphins in the Gulf of Mexico. We recognize the need for individual SARs for stocks where management actions are required or likely to be required, and we also recognize the commitment of NMFS staff time for developing and maintaining individual SARs. The Atlantic SRG would like to discuss with NMFS identifying and prioritizing stocks to be documented in individual SARs as opposed to remaining in a combined BSE SAR.

Response: NMFS has been taking the approach of creating individual SARs for Gulf of Mexico BSE stocks when significant new information is available and/or when there is a pressing management need, as staff time allows. NMFS agrees with the Atlantic SRG that individual SARs for all 31 stocks may not be necessary, and annually we evaluate available information and priorities. NMFS can create a list of stocks that we anticipate may be priorities going forward and discuss this list with the Atlantic SRG at the next meeting. However, we must recognize that management needs may change over time due to unforeseen circumstances (e.g., oil spills, construction projects, etc.).

f. The SRG supports the modeling approach developed by Garrison and Rosel (2017) to evaluate the specific identity of pilot whales seriously injured or killed in longline fisheries in the region of overlap. Given the continued warming of the Northwest Atlantic, however, and the availability of a large number of satellite tags deployed recently on short-finned pilot whales in this region, the SRG recommends a re-appraisal of the northern limit of the distribution of this species and the approach used in the modeling work of Garrison and Rosel (2017).

Response: There have been few additional biopsy samples collected in the potential region of overlap since those described in Garrison and Rosel (2017), limiting our capability to update this analysis. Once the tag data collected by Duke University are published, then we could potentially integrate those data into a similar analysis that would assess the effects of environmental conditions on the distribution of short-finned pilot whales. Such an analysis would be improved by tag data deployed on long-finned pilot whales, but to our knowledge no such data have been collected in recent years. It should be noted that the Garrison and Rosel model uses contemporaneous satellite SST data to predict the relative distribution of the two species each year and month for the purposes of estimating abundance and bycatch, as opposed to a fixed spatial boundary.

11. The Atlantic SRG appreciated the presentation on offshore wind energy and aquaculture development and their potential impacts on marine mammal stocks in the Northwest Atlantic. We would appreciate being updated regularly on this issue and are available to provide scientific review, as needed. We also request a briefing at our next meeting on mitigation plans for windfarm development.

Response: We will provide updates and a briefing on the issue at the next Atlantic SRG meeting.

12. The Atlantic SRG commends NOAA for development of new range maps that include acoustic data as presented at our February 2020 meeting. We support rapid development of these maps and would welcome information on their anticipated roll out in all SARs.

Response: Thank you, we are working on improving maps and will update the Atlantic SRG with new acoustic data maps as information becomes available.

13. The Atlantic SRG believes that the departure last year from the Atlantic SRG of the long-serving representative from the environmental nongovernmental community (e.g., in this case The Humane Society of the United States) represents the loss of an important perspective on marine conservation. In this regard, the Atlantic SRG requests that NOAA Fisheries solicit a new representative from the conservation NGO community; such an individual should have a strong science background in protected species conservation. If NOAA is concerned that the addition of another member would make the Atlantic SRG too large, there are individuals on the Atlantic SRG who are willing to step down for this replacement.

Response: We agree. We strive to achieve a balanced representation of viewpoints among the individuals on each SRG. We will continue to prioritize new representatives with experience in the conservation and non-governmental sector to fill this identified expertise gap.

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